WHAT IS CLAIMED IS:

1. A planar optical waveguide, comprising:

a layered film formed on a substrate; and

an optical waveguide core formed in said layered film;

wherein a cross section of said optical waveguide core is substantially quadrilateral;

wherein a dopant layer including refractive index-lowering molecules is provided around said optical waveguide core having a substantially quadrilateral cross section; and

wherein said refractive index-lowering molecules included in said dopant layer are unevenly distributed in said optical waveguide core with a concentration that is higher toward outer sides and corners of said optical waveguide core, whereby a graded-index optical waveguide is constituted.

2. The planar optical waveguide according to claim 1,

wherein said dopant layer is formed on said substrate; and

wherein said optical waveguide core is formed on said dopant layer.

3. The planar optical waveguide according to claim 1,

wherein said dopant layer is formed on an upper side

of said optical waveguide core.

4. The planar optical waveguide according to claim 1,

wherein said optical waveguide core comprises a polymer material;

wherein said refractive index-lowering molecules comprise fluorinated compatible molecules whose fluorine concentration is higher than that of said polymer material; and

wherein said fluorinated compatible molecules are reacted with reactive groups included in said polymer material to immobilize said fluorinated compatible molecules by chemical bonding.

5. The planar optical waveguide according to claim 4,

wherein said polymer material is at least one fluorinated polymer material selected from the group consisting of fluorinated polyimide, fluorinated polysiloxane and fluorinated polymethacrylate resins; and

wherein said refractive index-lowering molecules comprise fluorinated compatible molecules whose fluorine concentration is higher than that of said fluorinated polymer material.

6. A method for manufacturing a planar optical waveguide, comprising:

(a) a step of forming a first dopant film including

refractive index-lowering molecules on a substrate;

(b) a step of forming a thin film to serve as optical waveguide core on the substrate, and subsequently forming an optical waveguide core with substantially quadrilateral cross section by etching said thin film;

(c) a step of forming a second dopant layer including refractive index-lowering molecules on an upper side of said optical waveguide core with substantially quadrilateral cross section; and

(d) a step of doping the refractive index-lowering molecules from said first and second dopant layers into said optical waveguide core with substantially quadrilateral cross section, whereby said refractive index-lowering molecules is distributed unevenly with a concentration that is higher toward outer sides and corners of said optical waveguide core.

7. The method for manufacturing a planar optical waveguide according to claim 6, wherein step (d) includes a thermal processing step.

8. The method for manufacturing a planar optical waveguide according to claim 6,

wherein said refractive index-lowering molecules are fluorinated compatible molecules; and

wherein, by at least one process selected from the group consisting of UV light processing, electron beam

processing, plasma processing and thermal processing, a polymer material constituting said optical waveguide core is reacted with reactive groups included in said fluorinated compatible molecules, which are the refractive index-lowering molecules with which the optical waveguide core is doped, whereby said polymer material and said fluorinated compatible molecules are immobilized by chemical bonding.

9. A planar optical waveguide having an optical waveguide core,

wherein said optical waveguide core is formed over a substrate;

wherein a low refractive index layer including refractive index-lowering molecules is formed around said optical waveguide core; and

wherein said optical waveguide core includes said refractive index-lowering molecules at its periphery.

10. The planar optical waveguide according to claim 9, wherein said refractive index-lowering molecules are distributed with higher concentration toward the outer sides of said optical waveguide core.

11. A method for manufacturing a planar optical waveguide, comprising:

a step of forming a dopant layer including refractive

index-lowering molecules on a substrate; and

a step of forming an optical waveguide core on said dopant layer, and subsequent thermal processing.

12. A method for manufacturing a planar optical waveguide, comprising:

a step of forming an optical waveguide core on a substrate; and

a step of forming a dopant layer including refractive index-lowering molecules around said optical waveguide core, and subsequent thermal processing.

13. A method for manufacturing a planar optical waveguide, comprising:

a step of forming a first dopant layer including refractive index-lowering molecules on a substrate;

a step of forming an optical waveguide core on said first dopant layer; and

a step of forming a second dopant layer including refractive index-lowering molecules on said first dopant layer, covering said optical waveguide core, and subsequent thermal processing.

14. The method for manufacturing a planar optical waveguide according to claim 11, including heating such that lines of equal concentration of said refractive index-lowering molecules in a cross section of said optical

waveguide core become substantially circular.

15. The method for manufacturing a planar optical waveguide according to claim 12, including heating such that lines of equal concentration of said refractive index-lowering molecules in a cross section of said optical waveguide core become substantially circular.

16. The method for manufacturing a planar optical waveguide according to claim 13, including heating such that lines of equal concentration of said refractive index-lowering molecules in a cross section of said optical waveguide core become substantially circular.

17. A polymer optical waveguide, made of a polymer composition obtained by adding, to at least one fluorinated polymer material selected from the group consisting of fluorinated polyimide, fluorinated polymethacrylate and fluorinated polysiloxane, fluorinated compatible molecules whose fluorine concentration is higher than that of said fluorinated polymer material.

18. The polymer optical waveguide according to claim 17, wherein said fluorinated compatible molecules are unevenly distributed with a concentration that is higher toward outer sides of a cross section of said polymer optical waveguide.

19. The polymer optical waveguide according to claim 17, wherein reactive groups included in said fluorinated compatible molecules are reacted with reactive groups included in said fluorinated polymer material to form chemical bonds.

20. The polymer optical waveguide according to claim 17,

wherein said fluorinated polymer material is a fluorinated polyimide; and

wherein said fluorinated compatible molecules are a fluoride selected from the group consisting of

(1) polyvinylpyrrolidone,

(2) (methylmetacrylate - vinyl pyrrolidone) copolymer, and

(3) composition including polymethylmethacrylate and (methylmetacrylate - vinyl pyrrolidone) copolymer.

21. The polymer optical waveguide according to claim 17,

wherein said fluorinated polymer material is a fluorinated polymethylmethacrylate resin; and

said fluorinated compatible molecules are an organic compound including a tertiary fluoromethyl group.

22. The polymer optical waveguide according to claim 21,

wherein the organic compound including a tertiary fluoromethyl group includes at least one selected from an

OH group, an epoxy group and an isocyanate group; and

wherein at least one of said OH group, said epoxy group and said isocyanate group is reacted with a carboxyl group in said fluorinated polymethylmethacrylate resin to form a chemical bond, whereby immobilization is achieved.

23. The polymer optical waveguide according to claim 17, wherein said fluorinated polymer material is a fluorinated polysiloxane, and said fluorinated compatible molecules are a siloxane skeleton compound including a tertiary fluoromethyl group.

24. The polymer optical waveguide according to claim 23,

wherein said siloxane skeleton compound added to said fluorinated polysiloxane is at least one of a Si-OH group and a Si-Cl group; and

wherein chemical bonds are formed by reacting said at least one of a Si-OH group and a Si-Cl group with a reactive group in said fluorinated polysiloxane.

25. The polymer optical waveguide according to claim 17, wherein an organic compound including said fluorinated compatible group and an incompatible group including active hydrogen is added at not more than 2wt% to said fluorinated polymer material.

26. The polymer optical waveguide according to claim 25,

wherein said fluorinated compatible group is at least one selected from the group consisting of $-CF_{1-3}H_{2-0}$, $=CF_2$, $-C_nF_mH_{2n-m+1}$ (with $n \geqq 1$, $2n \geqq m \geqq 1$), $-C_nF_mH_{2n-m}$ (with $n \geqq 1$, $2n \geqq m \geqq 1$), and $-C_6F_mH_{6-m}$ (with $5 \geqq m \geqq 1$); and

wherein the incompatible group including active hydrogen is at least one selected from the group consisting of $-CONH_2$, $-NH_3$, $-OH$, and $-COOH$.